

# An international comparison of the science education priorities of science teachers, lecturers and students in two developing countries: Turkey and Lesotho

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## ABSTRACT

Lesotho and Turkey are two developing countries, both relatively deficient in educational resources – one in Southern Africa, and the other straddling the continents of Europe and Asia in the Middle East. This study reports and compares the priorities and responses of (a) 172 Turkish science teachers, lecturers and students, and (b) 171 Lesotho science educators and students, to 20 literature derived recommendations for improving science education in the two countries. Both quantitative and qualitative survey data are analysed. The educational outcomes of the study are commonly identified areas of future concentration and corresponding sets of recommendations for science teacher training curricula in these two developing nations. In both Turkey and Lesotho the most frequently prioritised recommendations are found to be similar. They are: to engage *more self discovery* in science learning; to introduce *more real life skills* into science teaching; to utilise better science *teaching methods*; and to acquire *more resources* for science and technology lessons.

oping countries (Moru & Rochford 1999:145-147). That investigation into current issues in science curriculum improvement in emerging Southern African nations was situated within the larger context of Solomon's (1998) conceptual framework for science education policy presented by her in person in Cape Town in 1996.

In 2001 the first author considered that a similar set of 20 literature derived recommendations could also be presented to a comparable sample of science teachers and tertiary science students in another developing country – Turkey (whose international currency exchange rate is on a par with that of the South African rand). Thus, the fourth and fifth authors, both Turkish English bilingual science teachers, arranged the translations and data collection and analysis in collaboration with the first author, using a convenient and willing sample of participant science teachers, lecturers and students in Turkey. The third author, a Sesotho English bilingual science teacher, implemented the data collection with a similar sized convenient sample of science teachers and tertiary students in Maseru, Lesotho.

## BACKGROUND

These ongoing initiatives developed as an outgrowth of a larger six year study in Southern Africa prompted by the *White Paper on Education and Training in a Democratic South Africa: First Steps to Develop a New System*, that the Government of the Republic of South Africa had released in 1995. In its statement of *Values and Principles of Education and Training Policy*, the White Paper stated that an appropriate mathematics, science and technology initiative was

## INTRODUCTION

In 1999 an extensive review of the science education policy literature and government white papers disclosed at least twenty possible recommendations for improving the current qualification programmes and science curricula relevant to science teacher education training and up grading in devel

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essential to make up the chronic national deficit for economic advancement.

Meanwhile, in Europe, Solomon (1998) had developed a comprehensive theory and model of the multiple contents of the public understanding of science that was of particular relevance to emergent and developing countries such as Turkey, India, Malawi, Botswana, South Africa, and so on.

In her paper, *The development of life skills through science and technology for the 21st century*, presented in Cape Town, Solomon looked beyond the content of the school science curriculum, and beyond practical work in school laboratories. Among other things, she highlighted the wider importance of science in everyday life and in social settings. She moved the context of learning science into the home. She engaged economics and science. She linked the learning of science with the employment of trained technical experts in the labour market, and with vocational skills and core communication skills to prepare school learners for relevant careers needed by industrialists in a diversity of linguistic and cultural traditions. These latter considerations were of particular relevance to teaching science in regions such as Turkey, Lesotho and its neighbouring countries in Southern Africa.

Finally, Solomon focussed on teaching science for the development of the individual learner, encouraging the expansion of independent learning skills such as creativity and curiosity. She explained how the teaching of science could be used for the personal growth and development of the individual by enhancing his or her particular life skills, communication skills, vocational skills and citizenship skills, as well as the learner's feelings and emotions and long term values. Of particular relevance to Lesotho was her expressed concern that science is a requirement of specific professions or vocational board bodies.

She explained that science could also be taught for its own rational development as a logically structured set of concepts, theories, processes, skills, evidence, knowledge and limitations; and as a development of historical events.

Discussing the humanistic utility of science, Solomon showed how it could help to satisfy some of society's needs and contribute to the development of a nation. It could achieve this through solutions to better health; the environment; social reconstruction; the work place; ethical dilemmas; the international future competitive edge; mobilisation for informed and substantive social change; the cultural transmission of knowledge; and adaptable, novel retraining of the workforce.

All of these considerations raised by Solomon were also of particular importance to Turkey which, by

2002, had been granted a further \$16 billion by the International Monetary Fund to avoid Turkey defaulting on its debts (*The Times* 2002:17).

## PURPOSE

During 1995 a preliminary survey was made of the local and international literature on science/technology education by a team of seven postgraduate research students and staff at the University of Cape Town. This initial review disclosed fourteen categories of recurring recommendations for improving current curricula, teaching methods and textbooks in programmes of science/technology in developing and developed countries. These recommendations were substantiated by further literature reviews subsequently carried out in 1996 and 1997 (Moru & Rochford 1999:152-153).

Many of these context based recommendations in the literature were also consistent with the policy suggestions emerging from science teachers in under developed regions of South Africa (Rochford, Soko po & Kleinsmith 1997) and by science teachers in Lesotho. Finally, in 1999, important issues raised by science teachers and lecturers in Maseru increased from 14 to 20 the number of relevant policy recommendations (Moru & Rochford 1999:154-155).

In 2000 the scope of the study widened to include science teachers, lecturers and students in other emerging countries. Thus, the purpose of the next stage of the study was to report and compare the priorities and reasoning of convenient samples of participant science educators and their students in two developing countries: one in the Middle East and one in Africa. The samples comprised: (a) 172 Turkish science teachers, lecturers and students, and (b) 171 science educators and students in Lesotho. They responded both quantitatively and qualitatively to the 20 suggested literature derived recommendations for improving science education in schools in the two emerging nations.

## INSTRUMENT DEVELOPMENT AND OBJECTIVES

Pilot studies of potential instruments began by using critical research groups of post graduate science and technology teachers in small scale trials. Initially, fifteen categories of policy recommendations were derived, carefully worded and selected as being immediately relevant to Southern African science/technology education, and to the principles and values stated in the Republic of South Africa's Government White Paper. In summary form, these recommendations were as follows:

- 1 Introducing more real life skills into science/technology.
- 2 Paying more attention to gender issues in science and technology.
- 3 Concentrating more on South African environmental issues.
- 4 Using the sciences to advance and develop the community both socially and economically.
- 5 Paying more attention to language issues in science and technology.
- 6 Having the disadvantaged South African majority as its focal point .
- 7 Encouraging more science competitions.
- 8 Making more use of self discovery and self teaching in science.
- 9 Changing the curriculum to a compulsory science core plus science options.
- 10 Giving pupils in primary schools more basic science and technology.
- 11 Consulting all interested groups in the community.
- 12 Using computer aided instruction as part of science.
- 13 Promoting science/technology careers among school pupils.
- 14 Sharing science's intellectual excitement and sense of adventure.

A fifteenth suggestion that the learning of science might best be improved by engaging African indigenous technology and culture, and through the African worldview of life and thought system, received relatively little support. Consequently, this piloted item was subsequently deleted from the evolving questionnaire in the preliminary trials.

The first section of items on the resultant questionnaire used in further feasibility studies required respondents to say whether they agreed or disagreed with each of the fourteen suggestions offered for improving school science/mathematics/technology programmes. The final two items requested the respondents to focus on, and select, the two best ways for improving science/mathematics/technology curricula in the new South Africa; and to identify the two least important recommendations of the fourteen.

In pilot trials using samples of  $n = 47$  and  $n = 14$  respondents over periods ranging from seven days to seven weeks, test/re test reliabilities of the instrument, using the 14 provisional items, were found to vary from  $r = 0.88$  to  $r = 0.97$ .

In 1999 the survey instrument was subsequently adapted and expanded from fourteen to twenty items, to make it more relevant and appropriate for the Lesotho science teacher training context (Ministry of Education 1981; Calloids 1999). The most recent ideas of Solomon (1998) were also incorporated into the wording of the additional items. A complete copy

of the Lesotho version of the survey questionnaire is reproduced in Moru & Rochford (1999:154 155).

The instrument was translated into Turkish by the fourth and fifth authors in 2000. Where necessary, these researchers also processed back into English many of the qualitative comments and suggestions written in Turkish by some of the participating respondents.

## METHODOLOGY

During the period 1999 to 2000 the instrument was administered to the two convenient samples of science teachers, lecturers and science students in Lesotho (sample 1) and Turkey (sample 2), comprising a total of 343 respondents.

Sample 1(a) consisted of 94 urban/semi rural high school science educators in Lesotho. About 98% of the teachers spoke Sesotho as their first language. The distribution of males and females was even, and they were approximately within the age range 23 60 years. Sample 1(b) consisted of 77 Sesotho speaking primary science teachers. About 100% spoke Sesotho as their first language. There were more females than males, and their ages varied within the range 22 60 years.

Sample 2 comprised: (a) 19 Turkish university science/technology lecturers (12 female, 7 male), (b) 7 Turkish middle school science teachers (all male), (c) 87 Turkish science/technology university students (42 female, 45 male), and (d) 59 Turkish senior high school students of science and technology (18 female, 41 male). All the tertiary respondents read and wrote English as a second language; but many expressed themselves in both fluent Turkish and competent English when offering written reasons for their policy choices, preferences and recommendations for science teaching in Turkish schools. All 59 senior high school science/technology students received and answered their questionnaires in the Turkish language only.

Survey sampling was the research method employed in this study. This appears to be a particularly appropriate method of investigation that can be used to gather data from relatively large numbers of respondents at a particular time (Ary, Jacobs & Razavich 1979:25). Fink and Kosecoff (1985:5) regard it as a rediscovered strategy suitable for science education research.

## DATA COLLECTION

During 1999 the questionnaires were administered to sample 1 by the third author during the normal science teachers' meetings held at resource centres in

various districts of Lesotho. Because use of the resource centres was limited, she also moved from school to school, giving smaller groups of science teachers the questionnaires to complete during their free time. Subsequently, the questionnaires were collected after three to four days. Permission had also been sought from the school principals who were interested, co operative and helpful.

During 2000 both Turkish and English versions of the questionnaires were available for distribution by the first author, but all of the tertiary level Turkish respondents read and used the English version for the easier first section of the survey. On the second section of the questionnaire, which was open ended, many extended comments were written in clear, competent English, but some extended responses were also supplied either in Turkish, or in a combination of both languages.

The fourth and fifth authors administered only the Turkish language version of the survey with a convenient sample of senior science students in a willing high school as well.

## FINDINGS

### Quantitative results

Tables 1 and 2 present the quantitative data obtained for the responses from the two samples of surveyed science/technology teachers, lecturers and students. Figure 1 depicts in graphical form the results presented in Table 2, clearly showing four concurring peaks in the “best recommended policy preferences” selected by the two samples of respondents from Lesotho and Turkey.

*Table 1*

*Concurrence between the policy agreements of the Lesotho respondents and the Turkish respondents*

Suggestions for improvement	Lesotho respondents (N = 171)		Turkish respondents (N = 172)	
	Agree	Disagree	Agree	Disagree
1. More real life skills in science	<b>166</b>	4	<b>165</b>	11
2. More gender issues in science	86	<b>81</b>	96	<b>71</b>
3. More environmental issues	150	21	149	22
4. Science for community development	130	39	152	18
5. More attention to language issues	83	<b>86</b>	140	26
6. More focus on the disadvantaged	146	22	101	<b>62</b>
7. More competitions in science	<b>166</b>	3	152	18
8. More self discovery in science	<b>161</b>	8	<b>161</b>	11
9. Core plus options in curriculum	126	39	140	31
10. More primary school science	150	18	112	<b>60</b>
11. Wider community consultations	147	18	146	23
12. Computer aided instruction	139	29	151	26
13. Promoting careers in science	156	13	151	17
14. Excitement and adventure	159	8	156	12
15. Acquiring more resources	<b>166</b>	3	<b>165</b>	7
16. Conducting science campaigns	<b>167</b>	2	152	17
17. More extramural science activities	<b>169</b>	2	160	9
18. External support and recognition	155	12	153	17
19. Better teaching methods	<b>168</b>	3	<b>165</b>	6
20. Encouraging future prospects:	105	<b>61</b>	107	<b>58</b>

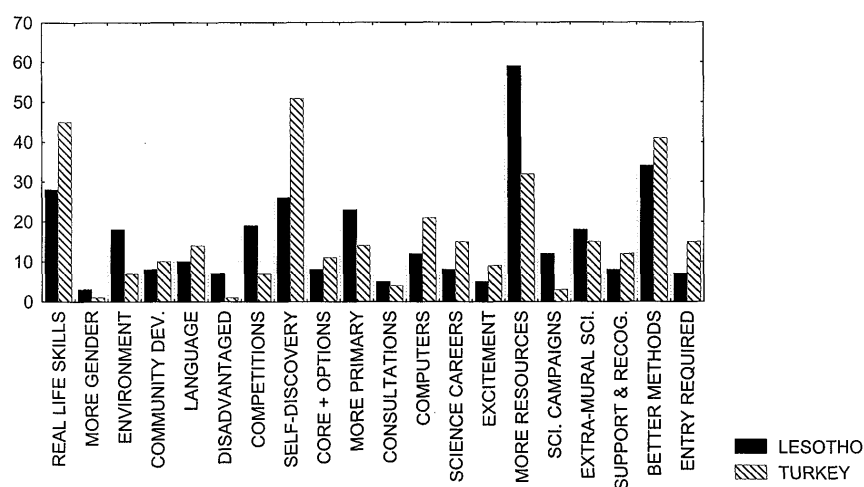
Table 2

*Concurrence between the policy preferences of the Lesotho respondents and the Turkish respondents*

Suggestions for improvement	Lesotho respondents (N = 171)		Turkish respondents (N = 172)	
	best	least	best	least
1. More real life skills in science	<b>28</b>	3	<b>45</b>	6
2. More gender issues in science	3	<b>54</b>	1	<b>60</b>
3. More environmental issues	18	13	7	18
4. Science for community development	8	27	10	14
5. More attention to language issues	10	<b>41</b>	14	19
6. More focus on the disadvantaged	7	19	1	29
7. More competitions in science	19	11	7	11
8. More self discovery in science	<b>26</b>	4	<b>51</b>	5
9. Core plus options in curriculum	8	12	11	16
10. More primary school science	23	13	14	<b>36</b>
11. Wider community consultations	5	18	4	12
12. Computer aided instruction	12	18	21	5
13. Promoting careers in science	8	5	15	9
14. Excitement and adventure	5	5	9	4
15. Acquiring more resources	<b>59</b>	8	<b>32</b>	4
16. Conducting science campaigns	12	4	3	10
17. More extramural science activities	18	7	15	6
18. External support and recognition	8	12	12	4
19. Better teaching methods	<b>34</b>	8	<b>41</b>	1
20. Encouraging future prospects:	7	31	15	<b>27</b>

Figure 1

*Frequencies of choices of the items most favoured by the Lesotho and Turkish respondents*



The main findings may be summarised as follows:

- In both Turkey and Lesotho the four most frequently prioritised recommendations were found to be similar, but in reverse order. They were: to *engage more self discovery* in science learning; to introduce *more real life skills* into science teaching; to utilise *better teaching methods*; and to acquire *more resources* for science lessons. The Turkish respondents emphasised more use of self discovery and self teaching, whereas the Lesotho respondents emphasised acquiring more resources for schools in that country.
- The *least* appealing suggestion to both samples was that *more attention be paid to gender issues* in science.
- Whereas the Turkish sample tended to steer away from placing more emphasis on *primary school science*, the Lesotho sample selected it as being relatively important (chi square = 9.58;  $p = 0.002$ ). The Lesotho respondents, instead, downplayed the importance of devoting more attention to *language issues* in science.
- The Turkish and Lesotho results presented in Table 2 correlate  $r = 0.68$  for the “best policy preferences” and  $r = 0.76$  for their “least important policy recommendations”. These findings indicate significant concurrences between the responses from the samples in these two emerging nations.

### Qualitative results

Only the main qualitative findings will be presented and summarised. Individual items that drew relatively little preference and comment will be omitted from this overview of the more prominent results. A summary of reasons given by the surveyed science teachers, lecturers and students in 1999 and 2000, in the open ended section of the questionnaire, for their choices of best or least important items, is as follows:

#### ***Introducing more real life skills into science (item 1)***

The following were common reasons given by 45 Turkish respondents who favoured item 1:

- Real life skills will bridge theory and teach students how to use information.
- They will increase the motivation of students.
- They will provide meaningful learning of science and technology.
- They will have a positive effect on the development of the country.
- Practical experimentation will be remembered by doing.
- Students will find real life skills enjoyable, understand concepts more easily and become imaginative.

- Self teaching and creativity will be improved.
- Learning science by doing will develop students' own experiences.
- Science students should be taught what is vital to life situations.
- When teaching science, examples around the students should be used and discussed.

The following were recurrent comments given by Lesotho respondents who were in favour of item 1:

- If more students are introduced to more real life skills, they can easily see the importance of doing science.
- Students understand science easily if it is related to their everyday life, as science should be taught for life.
- It can encourage students to like science and prosper in the subject.
- Relevance in any form of education is measured by its match to real life situations.

#### ***Making more use of self-discovery and self-teaching (item 8)***

The suggestion that students be encouraged to design their own experiments and field work to develop skills of problem solving, creativity, thinking, etc. drew the best positive response from the Turkish respondents. Item 8 was strongly supported by 51 Turkish respondents for the following reasons:

- Students will be using their five senses and own experiences.
- Creativity is a necessary basic item for learning science by self experimentation students can observe real phenomena.
- They can replace old teacher centred teaching methods.
- Practical science is important because it bridges the theory and students learn how to use information.
- It allows students to develop.
- It will make science enjoyable, interesting and easily understandable.
- Learning by doing is an effective way of learning.
- Because science is improving in the world, students should be motivated to discover new things.
- Students must be active participants in class, especially in laboratories.

Five Turkish respondents did not favour item 8. One said that there must be someone to show students how experiments should be done. Another pointed out that self teaching and self discipline will only be powerful when a student has the appropriate knowledge and cognition level. A third respondent said that what should be encouraged is group work, rather

than individual self discovery and self teaching, in order to improve understanding.

Item 8 was also strongly favoured by a smaller group of 26 respondents in Lesotho. They gave the following reasons:

- Doing science is all about exploration to develop understanding, and it will improve pupils' thinking skills.
- Students will be independent in life.
- Child centred teaching makes more use of all five senses than teacher centred learning.
- It motivates students and gives a challenge at the same time.

### ***Acquiring more resources for schools in Turkey and Lesotho (item 15)***

The following were reasons given by some of the 32 Turkish science teachers who were strongly in favour of item 15:

- Libraries could be better stocked – presently there is a lack of books.
- Computers could be used by students in school do research.
- More equipment would result in more effective science teaching.
- With additional resources, students' knowledge would develop and they would learn better.
- Resources provided for basic science would be valuable.
- Schools are crowded and there is a shortage of money. Classes should be smaller.

Reasons given by some of the 59 Lesotho science teachers who were in favour of item 15 were:

- Pupils learn better if they see things and are actively involved in practical work.
- It is useless to learn complicated concepts by just appreciating them in class and not seeing them in their immediate environments.
- Bringing resources to the students motivates learning and encourages independent learning.
- Having enough equipment enables teachers to impart information well at a higher level.

### ***Having better teaching methods (item 19)***

Many of the 41 Turkish science teachers who were strongly in favour of item 19 expressed the following views:

- Better teaching methods will make use of today's technology. They will also make use of laboratories and computers, so will improve learning facilities.
- Current science teaching in Turkey is too theoretical, so better teaching methods are the beginning

of understanding the subject well, and should be related to everyday life.

- New methods will motivate students and provide meaningful learning.
- New methods will motivate students to construct acceptable and flexible cognitive structures.
- Better teaching methods will increase interest in science.
- Instructional technology should be integrated into Turkish schools, particularly in science classes.
- Constructivist teaching methods should be adopted.
- Teachers should be given in service training programmes periodically, to help them to introduce new methods.

Many of the 34 Lesotho science teachers who were in favour of item 19 had strong feelings that:

- Better teaching methods might improve attitudes towards science.
- They will make science interesting.
- Better teaching methods will encourage pupils' participation (especially the child centred approach.)
- Appropriate teaching methods will equip pupils with skills, and enable them to study science, even after leaving school.
- Teachers can cope, even if the equipment is lacking.

### ***Other suggestions offered by the Turkish respondents in 2000***

The additional responses given in the open ended section of the questionnaire ranged over a wide range of issues: economic, intellectual, social, organisational, psychological, management, training, teachers' promotion, culture, philosophy, values, curriculum, didactics and professionalism:

- Science students should be encouraged to use libraries and the internet.
- A national science teachers' association should be established.
- Many science teachers are *not* trained at education institutions.
- Science teachers should be supported economically and paid more.
- Science teachers should be more sophisticated and intellectual; they should also do research.
- Science teachers should be promoted.
- The curriculum should be improved and redesigned according to the psychological and sociological needs, interests and attitudes of students and the community.
- The government should give science teachers more social rights.
- Science should be taught slowly and little at a

time; the temptation to teach too much science quickly should be resisted.

- Science teachers who do not like their job should be prevented from teaching.
- Science teachers should adjust to the individual characters of students, rather than simply applying their own educational philosophy.
- Science students should be taught to love their own people and country; and they should have respect for their customs and cultural values.

### **Additional suggestions offered by the Lesotho respondents in 1999**

The extra suggestions offered by the Lesotho respondents in the open ended section of the questionnaire ranged over fewer issues: student assessment and promotion, science syllabi and curricula, didactics, salaries and professionalism:

- Primary teachers should specialise.
- Career guidance should be done right from primary level.
- Visits to scientific institutions should be increased.
- Entry requirements to the higher classes or institutions should be revisited, since some existing requirements currently hinder students who perform excellently in science from proceeding.
- Teachers' salaries must be rewarding.
- Science teaching should be allocated more time and attention at primary level.
- High school teachers should be taught didactics and methodology thoroughly.
- Companies and all other interested groups in Lesotho should participate in designing science syllabi.
- Science teaching should be integrated so as to concentrate not only on the environment of Lesotho, but on the world as a whole instead.
- The examination board and science panel should meet and design a different way of assessing science students.

## **DISCUSSION**

In Turkey, a new science curriculum was developed by the Board of Education and implemented in all elementary schools in 2000. The new elementary science curriculum was designed to accomplish following learning goals:

- Understand fundamental science concepts.
- Develop reasoning, critical thinking and problem solving skills by researching, hypothesising, testing and analysing.
- Apply science knowledge and skills in everyday experience, current events, and issues of science and society.

- Engage in a variety of learning activities that stimulate interest in science.
- Develop positive attitudes toward science.
- Promote a stimulus for further interest in science.
- Allow students to pursue science academically as well as professionally, and to acquire the knowledge appropriate to their needs.
- Prepare individuals to utilise science concepts, process skills, and values in making responsible everyday decisions.
- Prepare students who understand the major concepts, hypotheses, and theories of science and their applications.
- Develop with student skills that enable them to comprehend and to communicate scientific knowledge to others.
- Develop analytical and critical thinking skills.
- Develop an inquiry based learning environment.
- Provide students with necessary skills to make a scientific inquiry and solve scientific problems
- Provide students with necessary skills to deal with problems that they may face with in their daily lives by scientific approach.

The new curriculum seems to be promising for preparing students to today's world in Turkey. It considers the needs of society and students, and it helps students to understand and apply the knowledge through experimentation, observations, and projects. Different teaching methods and experiences have also been suggested.

One interesting source of divergence between the respondents in Turkey and Lesotho was the set of reactions to the suggested policy to provide more basic science to all children in primary schools. The responses of the samples were significantly different ( $\chi^2 = 9.58$ ;  $p < 0.01$ ). This item option was rejected by 36 Turkish respondents, but by only 13 Lesotho science teachers – possibly because nearly half of the Lesotho respondents (77) were teachers of primary school science, with a particular interest in this area.

However, the Turkish respondents who were not inclined towards item 10 gave many reasons. These included: the present primary school science content is satisfactory; primary school children have a limited capacity and they would be unable to cope; the inclusion of more basic science would not help the children to pursue further studies in science; and too much science at lower levels would bore students at higher levels. Other Turkish teachers said that the primary school syllabus would become over loaded – a comment that had been made earlier by four South African teachers in a sample of 368 that had been surveyed previously in 1996–1997 (Moru & Rochford 1999:148). They had also remarked that more over crowding of the primary school syllabi would be the result.



However, in that same survey, 24 South African respondents who supported item 10 suggested that, if this recommendation is implemented, pupils in the primary school could receive the necessary applied knowledge of science, and this would arouse their interest. In 2000, the Turkish teachers who supported an increase in primary school science said that science is best learned at an early age, provided that the basic science taught is trustworthy.

Regarding the importance of self discovery and self teaching through science, many South African respondents also commented in favour of item 8. They said that these learning methods cultivate an interest in and understanding of science. They pointed out that, for many pupils, the best learning is through experience. They felt that self discovery and self teaching encourage critical thinking. They argued that self discovery and self teaching motivate the pupils and are therefore very valuable methods for improving the teaching and learning of science and terminology curriculum. They said that these teaching methods have the capability to develop problem solving skills and creative thinking. They added that skills gained through self teaching can be applied in future careers; and self discovery and self teaching help students to realise their talents. In Scotland, Chisholm (2002:19) reached a similar conclusion independently.

Four South African respondents who opposed item 8, however, expressed a concern that students do not always have the necessary knowledge to teach themselves.

In South Africa, during 1996-1998, the main consensus recommendations arising from 368 science teachers' responses to 14 literature derived sugges-

tions are consistent with the current findings from Turkey and Lesotho: The three *best ways* to improve South African science education were: (1) to introduce *more real life skills* into science teaching (131 votes); (2) to give much more basic science in *primary schools* (128 votes); and (3) to make more use of *self discovery* by science students (120 votes).

## CONCLUSION

This study has reported and compared the priorities and responses of (a) 172 Turkish science teachers, lecturers and students, and (b) 171 Lesotho science educators and students, to 20 literature derived recommendations for improving science education in the two countries. The educational outcomes of the study are commonly identified areas of future concentration and corresponding sets of recommendations for science teacher training curricula in these two developing nations. In both Turkey and Lesotho the most frequently prioritised recommendations are found to be similar. They are: to engage *more self discovery* in science learning; to introduce *more real life skills* into science teaching; to utilise better science *teaching methods*; and to acquire *more resources* for science and technology lessons.

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